Approved by _____Bill Stepp_____ date _____4/15/04_____

NOTICE: **DOCUMENT FOLLOWS:**

NASA BALLOON PROGRAM
NATIONAL SCIENTIFIC BALLOON FACILITY
GROUND SAFETY PLAN

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ACRONYMS

1. SCOPE

This document is the Balloon Ground Safety Plan (BGSP) for operations performed by the National Scientific Balloon Facility (NSBF). The BGSP is derived from the NASA Goddard Space Flight Center (GSFC) Wallops Flight Facility (WFF) Range Safety Manual, identified as RSM 2002.

The NSBF BGSP applies to all balloon operations performed by the NSBF personnel at Palestine, TX, Fort Sumner, NM, or any remote sites.

The ground safety goal of the NSBF is to minimize risks to personnel and property in conducting operations and to prevent mishaps that might result in embarrassment to NSBF, NASA, and the United States Government.

It is the policy of the GSFC/WFF and NSBF that all systems be designed such that a minimum of two independent unlikely failures must occur to expose personnel to a hazard.

2. SAFETY RESPONSIBILITIES

The NSBF Operations Department Head (Campaign Manager at remote sites) is responsible to ensure compliance with the provisions of the BGSP for NSBF operations and for science user operations.

The NSBF Reliability, Safety, and Quality Assurance (RSQA) is responsible for institutional support for the NSBF and providing any special safety equipment to support the requirements of the BGSP.

The NSBF Radiological Safety Officer (RSO) is responsible for the receiving and provisions of appropriate storage for all radioactive sources brought to NSBF, Fort Sumner, or remote sites. He insures that procedures, handling, and storage are in compliance with NSBF policy and criteria and the Nuclear Regulatory Commission (NRC).

The Experimenter is responsible in supplying to NSBF documentation identifying hazards and control methods. The typical payload hazards can be identified in the Balloon Flight Support Application and the Ground Safety Data Entry Form (Figure 1 at the end of this BGSP). Other hazards shall be identified by filling out the SPECIAL PAYLOAD SAFETY PLAN FORM (Figure 2 at the end of this BGSP). The user is also responsible for obtaining licenses from other agencies (e.g. a license for radioactive sources and removal of the source). Hazards will be identified in the user request for support and reviewed and approved by NSBF safety personnel.

No less than six months prior to flight, the NSBF is responsible to provide notice to the NASA Balloon Program Office of any intent to fly radiological sources. The NASA Balloon Program Office will submit requests for approval from the Nuclear Safety

Launch Authority. NSLA approval is prerequisite to use of any radiological source in flight. NSBF will provide information as to the number of sources, to include type, total activity, and packaging for each source intended to be flown on any balloon mission.

The Crew Chief is responsible to direct the movement and operation of all heavy equipment used in balloon launch operations in such a way as to ensure safety and minimize the number of personnel exposed to hazards associated with this equipment. The Crew Chief shall verify that all launch equipment is configured in accordance with the approved mechanical certification provided by the NSBF Engineering Department.

3.0 HAZARDOUS SYSTEMS CONTROL

The BGSP addresses the following hazardous systems and operations, and identifies the subsection where these hazards and their controls are addressed.

Ionizing Radiation (3.1)
Lasers (3.2)
Chemicals (3.3)
Pressure Vessels (3.4)
Pyrotechnics (3.5)
Heavy Equipment Operation (3.6) "Hot" Flight
Terminate System (3.7) Non Ionizing Radiation
(3.8)
Electrostatic Discharge (3.9)
Electrical Storm (3.10)

3.1 Ionizing Radiation

- All operations conform to the standard of the NRC, 10 CFR, and applicable regulations for state or country in which operation occurs.
- The Experimenter provides the NSBF RSO with applicable Material Safety Data Sheets (MSDS) for each source being used.
- The following will be provided in the GROUND SAFETY DATA ENTRY FORM, Figure 1, by Experimenter to the NSBF RSO:

    1. Sources to be used
    2. Total Activity
    3. Packaging
    4. Custodian

- Prior to start of all operations, the MSDS will be read and reviewed by all involved personnel.
- Procedures for the use, handling, and storage of the radioactive materials will comply with the specific procedures and policies identified in the NSBF Health and Safety Plan. A copy of these procedures must be posted in the work area.
- Only persons officially approved by the NSBF RSO may handle radioactive sources.
- No source shall be transported outside the designated storage/use area except by

authorization of the NSBF RSO.

- Where sources are sealed, eating and drinking and storage of personal items is permitted.
- In the event of a mishap, such as fire, source rupture, or damage, immediate notification to the responsible safety person for this operation is required. This safety person will be identified prior to start of any operation and method of communication (phone, walkie talkie, etc.) shall also be identified.

3.2 Lasers

- The following information will be provided by the Experimenters in Figure 1, GROUND SAFETY DATA ENTRY FORM. The experimenter shall seek direction from NSBF if he/she is not familiar with how to calculate Nominal Ocular Hazard Distance (NOHD) or optical density.

    1. Laser System
    2. Laser Class
    3. Wavelength
    4. NOHD
    5. Optical Density

- For ground operations (e.g. for calibration or alignment) of Class III or IV lasers, the following personnel restrictions will be in place:
    1. Personnel within the NOHD shall wear protective goggles with an optical density as submitted by the experimenter.
    2. Items will be removed from the beam path and personal items (such as watches or other jewelry) will be removed that may cause specular reflections.
    3. The laser will be operated below eye level.
    4. There will be a target termination point for the beam.
    5. All personnel not directly involved in laser maintenance or calibration must evacuate the area during laser operations. A safety observer shall determine the beam path is clear at the beginning of the operation, and maintain the beam path clear for the duration of the laser operation.
    6. The area will be roped off or traffic cones will be placed around the beam path.
    7. Laser operation warning signs will be posted around the beam path area.

3.3 Chemicals

- A general description of hazardous chemicals will be provided in Figure 1, the GROUND SAFETY DATA ENTRY FORM.
- More complete safety information is given in the MSDS.
    1. Personnel shall become familiar with the hazards posed by hazardous chemicals by reading the MSDS.
    2. One set of MSDS's will be posted in the work area.

- The Experimenter/Scientist submits to NSBF RSQA, for approval, procedures for the safe storage, handling, transfer, spillage and use of chemicals.
- Hazard areas will be determined and properly roped off or use traffic cones.
- Appropriate Personnel Protective Equipment (PPE) such as clothing, face shields or safety goggles, will be worn when handling hazardous chemicals.
- For spillage, trained personnel will respond to clean up per "Chemical Spill Procedure" in the NSBF Safety and Health Plan. These procedures will be reviewed prior to the start of a normal operation and be posted in the work area.
- When required, eye wash stations will be available.
- All tanks and transfer lines will conform to applicable ASME and DOT regulations.
- Figure 2 SPECIAL PAYLOAD SAFETY PLAN FORM will be filled out when controls fall outside normal operations.

3.3.1 Typical Chemical Hazards and Emergency Responses (see MSDS for specific information)

The guidance given in the following subparagraphs is meant to be very general in nature, and will not substitute for a better familiarity of the hazardous chemical obtained by reviewing the MSDS. Personnel who may come in contact with hazardous chemicals shall review the MSDS; especially review information in the MSDS addressing first aid and fire response.

3.3.1.1 Caustic/Acidic Materials

• Caustic/Acidic materials can cause skin bums it comes in contact with exposed skin and severe eye damage if it gets in the eye.

first aid In the event that someone is exposed to caustic or acidic substances, remove contaminated clothing, flush affected body part(s) with large amounts of water. Get medical attention as soon as possible.

3.3.1.2 Cryogenic Material

• Cryogens shall be handled in a manner that will prevent frostbite or injury to personnel. For cryogenic liquids, personnel shall wear a face shield, an apron, gloves, and closed-toed shoes. Pant legs are to be worn outside footwear. Tongs shall be used when handling dry ice.

first aid For eye contact, immediately flush eye(s) for at least 15 minutes. For skin, contact warm frostbite area with warm water. **Do not use dry heat.** Remove any contaminated clothing. Get medical attention.

3.3.1.3 Flammable Liquids and Gases

- The relative degree of flammability of a substance is determined from its flashpoint temperature; that is, the lower the flashpoint temperature, the. more

flammable a substance should be considered.

- When using flammable liquids or gases, pre-test leak checks will be performed and chemical leak test procedures will be generated prior to starting any operation.

- If a leak occurs, operations will be suspended until the cause has been addressed and resolved.

fire response Generally, for all flammable substances, dry chemical (i.e. Class ABC) fire extinguishers are acceptable for fighting fires. The fire extinguisher shall be available in the work area in the event of a fire.

3.3.1.4 Toxics

- The hazard of a toxic chemical leak is addressed by periodic system leak checking. If the hazard of exposure to the toxic chemical is considered severe by NSBF, additional measures may to be taken, such as continuous monitoring of the toxic chemical, and/or secondary containment of the toxic chemical.

first aid In the event of toxic chemical inhalation, remove the victim from the contaminated environment, and allow victim to breathe fresh air. Put the victim on oxygen (if available) if the symptoms indicate a high level of exposure. Keep the victim warm, comfortable, and quiet. Seek immediate medical attention.

For skin (or eye) exposure, remove all contaminated clothing, and flush affected area for at least 15 minutes. Seek immediate medical attention.

3.4 Pressure Systems

- If the experimenter is supplying his/her own pressure system, the following information for their pressure shall be supplied (in Figure 1).

    1. Gas Bottle Bottle Pressure
    2. Regulator Pressure
    3. Tank Design Standard
    4. Safety Factor (Other Components: lines, fittings, regulator, valves, etc.)

- Fill out the SPECIAL PAYLOAD SAFETY FORM, Figure 2, for pressure systems that do not meet standard DOT or ASME pressure vessel requirements, and exceeds 19,130 Joules (14,240 ft-lbs), or have operating pressures greater than 100 psig for gases and 1000 psig for liquids. Tanks in these systems shall be designed to a standard agreed upon by NSBF, such as AIAA S-080 or AIAA S-081.
- Pressure system assembly and operating procedures shall be submitted to NSBF RSQA for review and approval. NSBF has a certification and approval process for gondola/payloads having pressure systems.

3.5 Pyrotechnics

- All NSBF pyrotechnics are rated Class 1.4S explosives and are self-contained.
- NSBF personnel storing, handling, or installing pyrotechnics have had approved training.
- All Electro-Explosive Devices (EEDs) must be 1 Amp, 1 Watt No Fire.
- The Experimenter will provide the following to NSBF in Figure 1, the GROUND SAFETY DATA ENTRY FORM:
    1. Device
    2. Quantity
    3. Function
    4. Resistance
    5. Pin-to-Case Resistance
    6. No-Fire Power and Current
    7. All Fire Current

- Experimenter will identify hazards, and develop installation procedures submitted to NSBF RSQA for approval.

3.6 Heavy Equipment Operation

- All NSBF lifting devices will conform to NASA-STD-8719.9.
- When using pins to suspend payload, two safety related cables will be attached between launch head and truck plate, which restrains truck plate.
- Regular inspections are performed according to procedures in NSBF Operations Policy 08-92-31, "Inspection of Tiny Tim". A copy of these procedures will be on Tiny Tim.
- The NSBF Support Engineering Department is responsible for providing mechanical certification of the spool, spool restraining vehicle, flight train, and launch vehicle for each launch configuration used at NSBF and remote sites. Guidelines for certification will be to ensure mechanical integrity of the entire system at the maximum planned gross inflation should the system be exposed to a 20 knot wind directly behind the balloon bubble at the completion of inflation.

3.7 "Hot" Flight Terminate System

("Hot" is defined as mating of pyrotechnic squib, motor, or actuator to the connector going to the initiator device (continuity plug) prior to start of inflation of balloon)

- For this specific operation, only trained personnel will be allowed in this hazard area.
- Electric wiring and power source will be completely independent and isolated from all other systems.
- All EEDS will be connected with approved shorting devices until assembled

on launch pad.

- NSBF staff utilized to assemble and install EEDs will have had training and be certified to perform EED installation.

3.8 Non Ionizing Radiation

- Compatibility tests with NSBF flight systems will have been performed for all radio frequency (RF) sources brought to NSBF or remote sites.
- The experimenter will provide all requested information pertaining to his/her RF system, so that NSBF may coordinate frequency utilizations and authorizations.
- To determine the RF hazard distance between an irradiating emitter and a pyrotechnic device, the experimenter will fill out the RF Pyrotechnic Hazard Distance Worksheet in Figure 1 (at the end of this BGSP).
- To determine the safe separation distance between an irradiating emitter and personnel, the experimenter will fill out the RF Personnel Hazard Distance Worksheet in Figure 1 (at the end of this BGSP). Particular attention will be paid to high power emissions of:

  a.) TDRSS Omni Antennas and High Gain Antennas
  b.) Science provided emitters greater than 1 watt for L/S Band
  c.) Any L/S Band emitters greater than 1 watt.
  d.) Any UHF/VHF emitters greater than 1 watt.

- More specific guidance (if required) for RF hazards to personnel may be found in IEEE C95.1-1999, which is listed in the references in Section 5.0.

3.9 Electrostatic Discharge

- Precautions are taken to reduce electrostatic discharge during balloon inflation.
- For balloon launch operations, static dissipating fluid will be applied to balloon ground cloth.
- A drag chain will be installed on launch vehicle to eliminate static charge.
- Prior to removal, alteration of configuration or opening of any electronic initiator system, ensure that pyrotechnic devices are electrically separated from such initiators and placed in a safe configuration with shorting plugs.

3.10 Electrical Storm

- Balloon inflation will not begin if an electrical storm is detected within 10 NM of launch site, which is in accordance with NSBF Operations Policy 8-74-5, "Thunderstorms and Launch Restrictions".
- If no equipment is available to detect electrical storm activity, inflation will be halted, and hazardous areas cleared upon hearing thunder or observing weather conditions that have an immediate potential of producing an electrical storm.

4.0 OPERATIONAL CONTROLS

4.1 Pre-Inflation Phase

This phase extends from the time that the payload is physically attached to the balloon launch vehicle prior to leaving the assembly area, and extends to the point that inflation of the balloon commences.

- Hard hats are required for personnel from the pre-inflation operations phase through the launch operations phase.
- Tiny Tim Operation:
    1. Vehicle engine will be off when attaching the "Tim" fitting.
    2. No personnel will be permitted to walk out on jaws of Tiny Tim when its engines are running.
    3. The hydraulic safety column is a secondary support when the payload is suspended from the jaws of Tiny Tim.
    4. No personnel will be allowed under the suspended payload while the Tiny Tim vehicle is holding the payload.

4.2 Inflation Phase

This phase starts when lifting gas is applied to the balloon, after it is connected to the complete flight system. The phase is complete when all lifting gas has been transferred to the balloon and all pre-flight preparations are complete.

- Hydrogen gas will not be used for balloon inflation except under special procedures that have been specifically reviewed and approved by the NSBF Operations Manager, NSBF RSQA, NSBF Site Manager and NASA Balloon Program Office.
- Category A hazard condition results when the NSBF Flight Terminate System is made "hot" by insertion of the continuity plug and balloon inflation begins. This Category A hazard continues through balloon launch or until helium is released from the balloon envelope or until the continuity plug is removed from the NSBF Flight Terminate System.
- The Category A hazard area is defined as extending from the NSBF parachute cut-away device to the launch spool. This area extends 10 feet on either side of the package and balloon up to the launch spool with a 50 foot radius around the center of the launch spool.
- Personnel will not straddle or remain under any portion of the parachute or balloon at any time when this Category A hazard exists.
- Hearing protection is required for the Helium diffuser operators and all other personnel working within 75 meters of the balloon bubble during inflation.
- The only personnel allowed within this Category A hazard area are NSBF launch personnel trained to perform the following operations:
    1. Stripping of protective wrap from the balloon at a position behind the launch spool

2. Stripping of protective wrap from the balloon from the balloon base fitting to the spool from a position on either side of the balloon
3. Inspection and documentation of the balloon and associated flight hardware from either side of the parachute and balloon
4. Installation of the balloon collar by the launch crew chief and support technicians
5. Deploying the terminate box assembly as slack is taken out of the system during inflation

4.3 Balloon Launch Phase

- The Category A hazard area for the balloon launch phase is defined as a rectangular area on the ground from the payload on the launch vehicle to the launch spool and extending one half of this distance to either side of line between the payload and launch spool. The area also consists of a semicircle in front of the launch vehicle with a radius equal to one-half the length of the total flight system.
- Category A hazard condition exists from the time that the balloon is released from the spool until the payload is released from the launch vehicle.
- All personnel and vehicles are excluded from this area except for NSBF launch crew personnel assigned to duties on the NSBF payload launch vehicle, and the spool operator, who will be located at the spool vehicle.
- The number of personnel riding on the launch vehicle during an operation will be minimized to reduce hazards during launch. A minimum crew will consist of the Crew Chief, Driver, one or two mechanical technicians to push the payload off at launch, and an electronics technician.
- An electronics technician will ride on the launch vehicle with an approved portable command system capable of terminating the flight upon command from the Crew Chief.
- The Crew Chief shall be solely responsible for signaling the spool operator to release the balloon from the spool. An approved communication mechanism (handy talkie, launch vehicle light system, etc.) shall be employed by the Crew Chief to signal the spool operator to release the balloon.
- If communications between Crew Chief and Spool Operator are lost, operations will be suspended until the communication problem is resolved.
- The spool mechanism will be designed such that two actions are necessary to activate the spool and release the balloon (i.e. safety pin and lever release.)
- An electronic intercom system will be installed on the launch vehicle such that at a minimum, the Crew Chief, driver and electronics technician have voice communication. This system will be independent from other voice communication systems to eliminate the possibility of interference.
- For crane-head launches two safety cables will attach the truck plate to the crane head. The cable release mechanism to launch the balloon will be an NSBF Mechanical Engineer approved mechanical lever arm.
- For Tiny Tim launches, the jaw release mechanism requires two actions to arm the

Crew Chief `s launch button. On Tiny Tim, a separate jaw release switch will be located in the driver's cab should the Crew Chiefs release button malfunction. This switch shall be protected from inadvertent actuation by a hinged cover until immediately prior to balloon releases.

- The Crew Chief shall be responsible for deciding whether to initiate spool release and balloon launch. If at any point during an operation, the Crew Chief observes conditions that could result in danger to personnel, the decision will be made to destroy the balloon in the spool or terminate the flight prior to payload release. Balloon collar release will be initiated by command of the Campaign Manager or his designee. The person issuing the command will be located in a safe area off to the side of the operation where the entire flight train is visible. Collar release will take place such that there is no danger of the collar, collar receiver or protective foam striking personnel riding on the launch vehicle.

4.4 Recovery

- Trucks used for recovery will comply with applicable DOT regulations.
- Scientific users will identify specific hazards and procedures associated with pick-up, disassembly, and transportation back to launch site.
- Recovery team will be briefed prior to launch.
- Whenever possible, a representative of the user will accompany the recovery team.
- A special recovery plan is prepared as needed (superconducting magnets, lasers, radioactive materials, etc.).
- When applicable, pressure vessels and cryogenic dewars have the pressure relieved and rendered safe per approved procedures submitted on the recovery form.
- Lithium batteries will be disconnected and stored in approved shipping containers prior to transport back to launch site.
- When required, the recovery team personnel shall wear protective clothing and equipment.

5.0. REFERENCES AND OPERATIONAL PROCEDURES

- Range Safety Manual for GSFC/WFF (RSM-2002)
- NSS-STD 1740.12, Safety Standard for Explosives, Propellants, and Pyrotechnics (NASA-STD-8719.12)
- GMI 1710.6, Certification and Recertification of Lifting Devices and Equipment and Critical Lift Requirements.
- IEEE C95.1-1999, American National Standard Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 30KHz to 100GHz
- GHB 1860.2, Radiation Safety Handbook
- GPG 1860.1, Radiation Protection-- Ionizing Radiation
- ANSI Z136.1-1993, American National Standard for the Safe Use of Lasers
- GHB 1860.3, Radiation Safety -- Laser
- NPD 8710.5, NASA Safety Policy for Pressure Vessels and Pressurized Systems
- NPG 1700.6, Guide for In-service Inspection of Ground Based Pressure Vessels

and Systems

- NSBF Safety and Health Plan
- CFR,Title 10, Parts 19 and 20
- NASA-STD-8719.9, Safety Standard for Lifting Devices and Equipment
- NSBF Policy # 4-74-2, "Balloon Tracking and Recovery"

- NSBF Operations Policy # 08-92-31, "Inspection of Tiny Tim"
- NSBF Operations Policy # 04-86-28, Procedures for Storage, Safe Handling, and Installation of Ordnance Devices.
- NSBF Operations Policy #8-74-5, "Thunderstorm and Launch Restrictions"
- NSBF OF-603-00-P Rev A, "Launch Equipment Configuration Certification Process"

IONIZING RADIATION INFORMATION (SECTION 3.1)

Radioactive Source	MSDS Available	Total Activity	Custodian	Packaging

LASER INFORMATION (SECTION 3.2)

Laser System	Laser Class	Wavelength	NOHD	Optical Density

CHEMICAL INFORMATION (SECTION 3.3)

Chemical Name	DOT ID #	MSDS Available?	Type of Hazard (i.e. cryogen, flammable, caustic/acidic, toxic, or other)	How is Hazard Controlled?	Controls in place verified?

PRESSURE SYSTEM INFORMATION (SECTION 3.4)

Bottle Pressure	Regulated Pressure	Tank Design Standard	Safety Factor of . Other Components

PYROTECHNIC INFORMATION SECTION 3.5)

Device	Quantity/Function	Bridgewire Resistance	Pin-to-Case Resistance	No-Fire Power & Current	All-Fire Current

RF PYROTECHNIC HAZARD DISTANCE E WORKSHEET (SECTION 3.8)

System	P_t = Av. Power, W	G = Ant. Gain, dBi	f = Xmit Freq., GHz	G_t = $10^{G/10}$	A = 1/f	P_{eff} = $P_t G_t$	B = $[P_{eff}]^{1/2}$	D (feet) = 1.851AB if 0.1 f < 20 D(feet) = 0.093B if 2 0 < f < 1 0 0

RF PERSONNEL HAZARD DISTANCE WORKSHEET (SECTION 3.8)

System	P_A = Av. Power, mW	G = Ant. Gain, dBi	f = Xmit Freq., MHz	G_t = l00 0	If 100 MHz < f < 300 MHz, P_d = 1 mW/cm^2 If 300 MHz < f < 3000 MHz, P_d = f'300 mW/cm^2 If f > 3000 MHz, P_d = 10 mW/cm^2	A = $(P_A G_t)/(4n P_d)$	D = $_A$ 1/2 cm

FIGURE 2. SPECIAL PAYLOAD SAFETY PLAN FORM

Hazardous System _____

How Controlled? _____

To What Extent is This System Handled? _____

Who Handles and/or Assembles? _____

Describe the Training/Experience of the Handler(s)/Assembler(s) with This Hazardous System.

_____

_____

_____

Are Procedures Available for the Handling and/or Assembly of this Hazardous System? ____

_____

_____

Risk Assessment Codes (RAC) — Definitions of Adjectives Given on Following Page

Qualitatively Assign a Hazardous System Severity _____

Qualitatively Assign a Hazardous System Probability _____

Note: The following RACs will need to be reviewed by NSBF personnel: IA, IB, IC, ID, IIA, IIB, IIC, IIIA, III, and NA.

Label	Adjective	Description of Probability
A	High	Probability > 0.3
B	Fair	Probability - 0.03
C	Slight	Probability – 0.003
D	Remote	Probability – 0.0003
E	Extremely Improbable	Probability < 0.00003

Label	Adjective	Description of Severity
I	Catastrophic	Personal Injury = Death or Permanent Injury 3rd Part Property Damage > $500K Equipment Loss > $1M
II	Critical	Personal Injury = Injury Requiring Hospitalization 3rd Part Property Damage = $25K - $500K Equipment Loss = $250K - $1M
III	Marginal	Personal Injury = Minor Injury 3rd Part Property Damage = $1K - $25K Equipment Loss = $10K - $250K
IV	Negligible	Personal Injury = Slight Injury 3rd Part Property Damage < $1K Equipment Loss < $10K

ACRONYMS

ASME American Society of Mechanical Engineering BGSP—Balloon Ground Safety Plan

Cat A Meets all the following requirements: 1) initiation of the system could lead to a chain of events which result in injury, death, or property damage; 2) sufficient energy exists to start the chain of events; and, 3) the energy output of the system is not controlled or contained.

Cat B Those systems which: 1) are highly improbable of being initiated; and, 2) do not cause injury or property damage by their own direct initiation or the sequence of events they initiate.

DOT Department of Transportation

EED Electro-Explosive Device

GSFC Goddard Space Flight Center

L Band US standard industry RF band from 1000 to 2000 MHz

MSDS Material Safety Data Sheet

NASA National Aeronautics and Space Administration

NOHD Nominal Ocular Hazard Distance

NM Nautical Mile

NSBF National Scientific Balloon Facility

NSLA Nuclear Safety Launch Authority

PPE Personal Protective Equipment

RAC Risk Assessment Code

RF Radio Frequency

RSO Radiological Safety Officer

RSQA Reliability, Safety, and Quality Assurance

S Band US standard industry RF band from 2000 to 4000 MHz

TDRSS Tracking and Data Relay Satellite System

UHF Ultra High Frequency, US standard industry RF band from 300 to 1000 MHz

VHF Very High Frequency, US standard industry RF band from 30 to 300 MHz